Measurement Uncertainty in Spatial Models: A Bayesian Dynamic Measurement Model

Supplementary Materials

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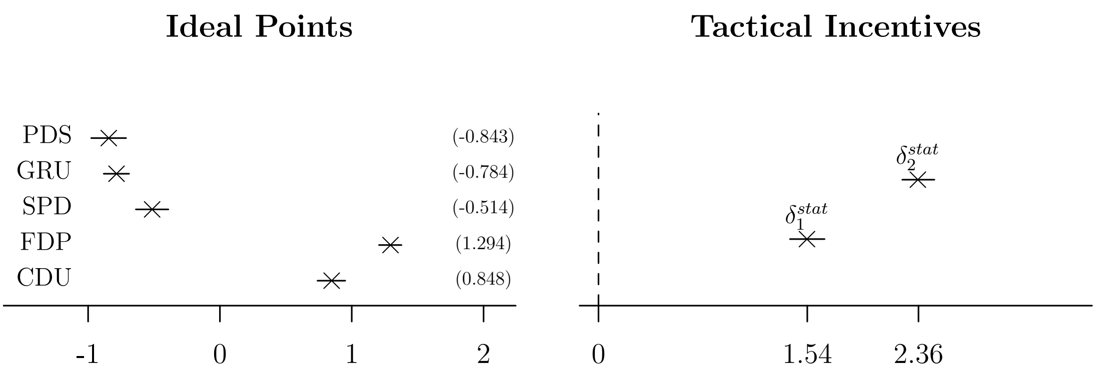
Overview

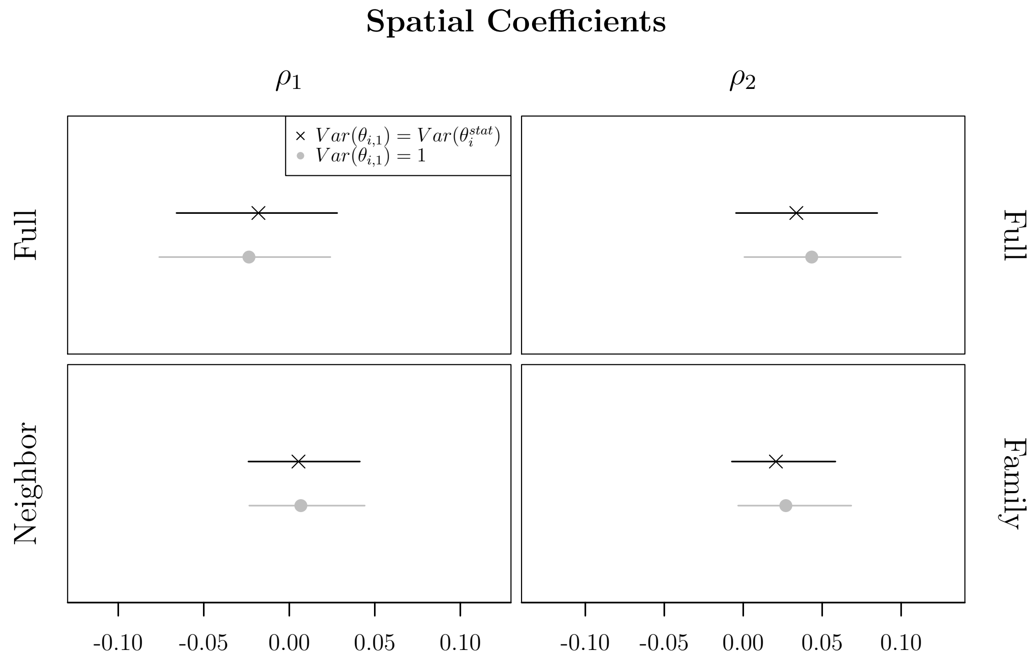
This document includes the supplementary materials discussed in the main article. Section A presents the estimates from the static model as introduced by Bräuninger, Müller, and Stecker (2016). Section B compares the spatial coefficients with different prior variance specifications at the initial period. Similar to Figure 1 in the article, Section C displays the parties' ideal point estimates from the full model specification. Finally, Section D includes the coefficient tables and robustness tests for different functional forms of the connectivity matrices.

A Estimates from the Static Model



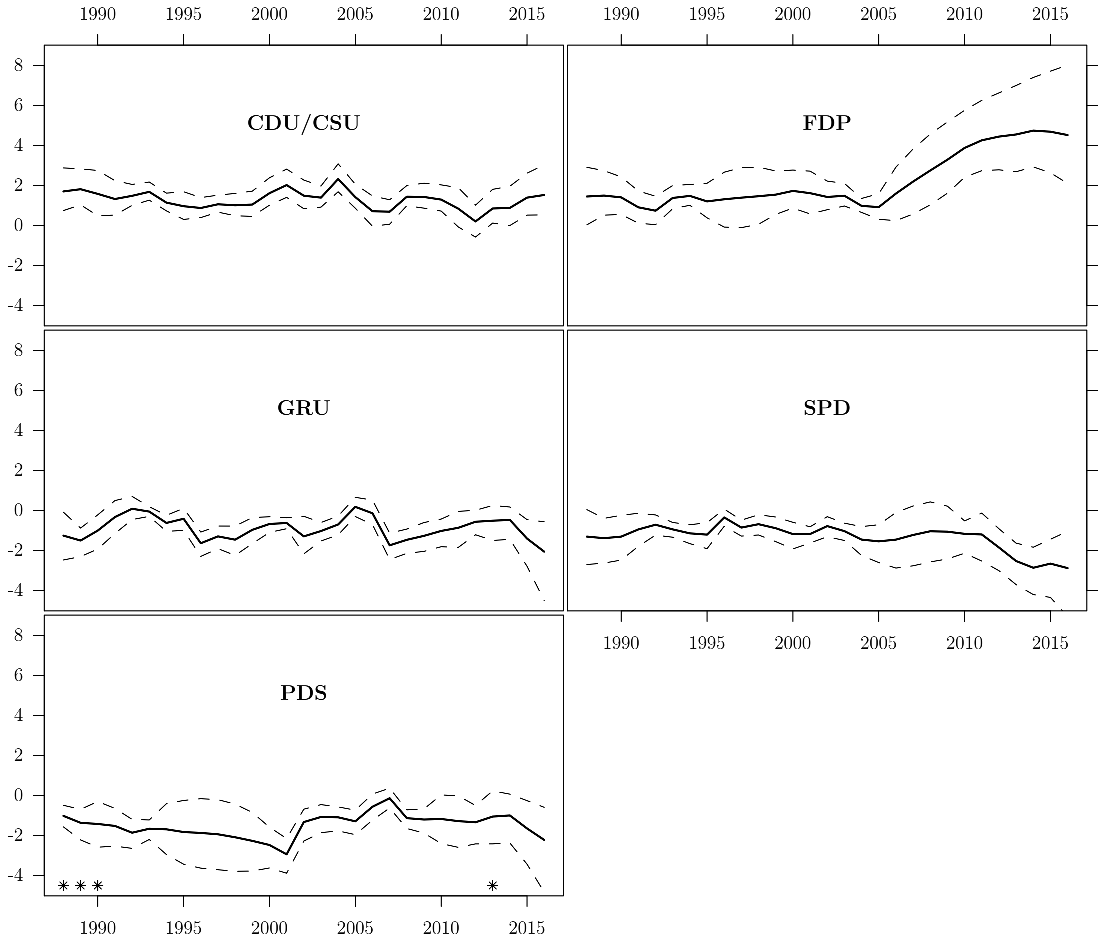
B Different Ideal Points' Prior Variances at the Initial Period

As a robustness test, I estimated all models reported in the article and changed the ideal points' prior variances at $t = 1$ to their posterior variability derived from the static model ($Var(\theta^{stat}_{CDU/CSU}) = 0.008$, $Var(\theta^{stat}_{FDP}) = 0.029$, $Var(\theta^{stat}_{SPD}) = 0.016$, $Var(\theta^{stat}_{Green}) = 0.012$, $Var(\theta^{stat}_{PDS}) = 0.02$). For identification purposes, I kept a prior variance of 0.1 for the *PDS*. The potential scale reduction factor shows no indication of nonconvergence. This figure shows that the spatial coefficient estimates are not sensitive towards the ideal points' prior variances at $t = 1$. It compares the two spatial coefficients derived from the different model specifications (Full model, Neighbor model, and Family model) across different specifications of the ideal points' prior variance at the initial period. Clearly, the alternative priors cause only minor differences in the estimates and the results are robust towards these changes.



C Dynamic Ideal Point Estimates (Full Model)

Similar to Figure 1 in the main article, this figure depicts the parties' ideal point estimates over time derived from the full model specification.



D Spatio-Temporal Autoregressive Model Estimates

This section shows the coefficient estimates from the models discussed in the article. The columns "No Error" depict the posterior means (with the respective standard deviation in parentheses) without measurement uncertainty. The columns "Measurement" contain estimates from the *Bayesian dynamic measurement model* with the STAR evolution functions.

D.1 Connectivity Matrices' Functional Form: Linear ($x = 1$)

	Neighbor		Family	
	No Error	Measurement	No Error	Measurement
Constant	0.013	0.013	0.053	0.127
	(0.035)	(0.058)	(0.048)	(0.095)
φ	1.015	0.952	1.001	0.911
	(0.026)	(0.064)	(0.024)	(0.061)
$\mathbf{W}^N$	8.1×10^{-4}	0.007	-	-
	(0.007)	(0.017)	-	-
$\mathbf{W}^F$	-	-	0.008	0.027
	-	-	(0.007)	(0.018)
Obs.	140	140	140	140
DIC	144	3208	143	3206

Note: The specification of the non-zero elements of all connectivity matrices is given by $w_{i,k,t} = (max_t - |\theta_{i,t} - \theta_{k,t}|)^x$ where $x = 1$.

	Full	
	No Error	Measurement
Constant	0.065	0.180
	(0.051)	(0.11)
φ	1.015	0.934
	(0.026)	(0.067)
$\mathbf{W}^N$	-0.006	-0.024
	(0.008)	(0.025)
$\mathbf{W}^F$	0.011	0.043
	(0.008)	(0.025)
Obs.	140	140
DIC	144	3207

Note: The specification of the non-zero elements of all connectivity matrices is given by $w_{i,k,t} = (max_t - |\theta_{i,t} - \theta_{k,t}|)^x$ where $x = 1$.

D.2 Connectivity Matrices' Functional Form: Dummy ($x = 0$)

	Neighbor		Family	
	No Error	Measurement	No Error	Measurement
Constant	0.011	0.011	0.097	0.253
	(0.034)	(0.058)	(0.061)	(0.117)
φ	1.023	0.955	0.986	0.845
	(0.026)	(0.064)	(0.027)	(0.072)
$\mathbf{W}^N$	-0.008	0.021	-	-
	(0.026)	(0.059)	-	-
$\mathbf{W}^F$	-	-	0.058	0.184
	-	-	(0.035)	(0.078)
Obs.	140	140	140	140
DIC	144	3210	141	3203

Note: The specification of the non-zero elements of all connectivity matrices is given by $w_{i,k,t} = (max_t - |\theta_{i,t} - \theta_{k,t}|)^x$ where $x = 0$.

	Full	
	No Error	Measurement
Constant	0.119	0.293
	(0.064)	(0.125)
φ	1.023	0.87
	(0.026)	(0.078)
$\mathbf{W}^N$	-0.033	-0.067
	(0.029)	(0.077)
$\mathbf{W}^F$	0.076	0.22
	(0.038)	(0.088)
Obs.	140	140
DIC	142	3204

Note: The specification of the non-zero elements of all connectivity matrices is given by $w_{i,k,t} = (max_t - |\theta_{i,t} - \theta_{k,t}|)^x$ where $x = 0$.

D.3 Connectivity Matrices' Functional Form: Quadratic ($x = 2$)

	Neighbor		Family	
	No Error	Measurement	No Error	Measurement
Constant	0.018	0.015	0.037	0.07
	(0.035)	(0.059)	(0.04)	(0.076)
φ	1.011	0.951	1.007	0.94
	(0.023)	(0.057)	(0.021)	(0.05)
$\mathbf{W}^N$	6.3×10^{-4}	1.8×10^{-3}	-	-
	(0.001)	(3.9×10^{-3})	-	-
$\mathbf{W}^F$	-	-	1.1×10^{-3}	3.8×10^{-3}
	-	-	(9.5×10^{-4})	(3.4×10^{-3})
Obs.	140	140	140	140
DIC	144	3209	143	3206

Note: The specification of the non-zero elements of all connectivity matrices is given by $w_{i,k,t} = (max_t - |\theta_{i,t} - \theta_{k,t}|)^x$ where $x = 2$.

	Full	
	No Error	Measurement
Constant	0.042	0.109
	(0.041)	(0.086)
φ	1.011	0.963
	(0.023)	(0.058)
$\mathbf{W}^N$	-8.1×10^{-4}	-0.006
	(1.8×10^{-3})	(0.0067)
$\mathbf{W}^F$	1.6×10^{-3}	0.008
	(1.4×10^{-3})	(0.006)
Obs.	140	140
DIC	145	3211

Note: The specification of the non-zero elements of all connectivity matrices is given by $w_{i,k,t} = (max_t - |\theta_{i,t} - \theta_{k,t}|)^x$ where $x = 2$.